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A TOTAL DIET STUDY OF PESTICIDES AND CONTAMINANTS FOR SOME TABLE READY DIETS IN GREAT CAIRO IN 2002

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ABSTRACT

A total diet study estimated the dietary intake of 80 organochlorine, organophosphorous, organonitrogen, and some pyrethroid pesticides, lead cadmium, copper and nitrates. Thirty-three of (table ready) diets were collected from cafeterias and restaurants in great Cairo during the year 2002. The study depends on the national food consumption data from the Institute of Nutrition, Ministry of Health. The overall results show that there is no significant environmental contamination of the average Egyptian diet. Organochlorine pesticide residues show no dietary intake while organophosphorous contaminates the diet at very low amounts from chlorpyrifos, chlorpyrifos-me and profenophos. Concerning the contamination of the total diet by heavy metals as general reveals no exceeding for the corresponding PMADI or PTWI established by the World Health Organization (WHO). The contamination of the diet by Cu, Cd and Pb was 3.7%, 3.5% and 3.2% respectively while nitrates contributed with 25.7% of the ADI. In conclusion we can consider the studied diets as safe and clean taking into consideration that the daily intake of potato chips, liver, falafel and medames should be decreased its daily intakes.

Keywords: Pesticides, residues, heavy metals, nitrates, table ready, total diet.

INTRODUCTION

National authorities have the responsibility and obligation to ensure that those toxic chemicals, such as pesticides, heavy metals, environmental contaminants and naturally occurring toxins are not present in food at levels that may adversely affect the health of consumers. Monitoring for compliance with regulatory standards is essential for consumer protection. Governments need to assess public health risks arising from the presence of toxic chemicals in food by estimating the actual dietary intake of contaminants for comparison with their corresponding toxicological reference intakes, such as Acceptable Daily Intakes (ADI) or Provisional Tolerable Weekly Intake (PTWI). Also, there is a great concern for analyzing nitrates in food samples. The presence of nitrates represents a high risk for human beings because of the formation of nitrite ions and consequently nitrosamines which are carcinogenic compounds (Johnson and Kross, 1990 and Bouchard *et al.*, 1992). Total diet studies provide, in general, the most accurate estimates of intakes of contaminants for a country as a whole. In addition, total diet studies explicitly take into account the kitchen preparation of food to assess the levels of contamination in foods as consumed (GEMS/Food 1999).

Total Diet Studies are a key public health risk assessment tool. They provide a snap shot of the safety and quality of food supply. A key characteristic of such studies is that foods are prepared table ready, which provides the best means of assessing the risk to consumers, in contrast to commodity based surveys, which analyze agricultural products as produced (GEMS/Food 2002). The goal of this risk assessment is to provide decision-maker with the available facts and best expert judgement upon which food safety policy can be based.

MATERIALS AND METHODS

Sampling:

Thirty-three representative (table ready) samples were collected from cafeterias and restaurants in Cairo during the year 2002. The selected samples are characterized by their popularity, availability in both rural and urban areas in the country. The common names of these food samples are as follows: boiled beans (medames), fried bean cakes (falafel), baked macaroni with sauce, macaroni (béchamel) cooked lentils, cooked pureed dry beans (bosara), cooked dry bean, mixture of lentils, rice, macaroni (koshari), cooked rice, cooked potato with sauce and meat, boiled potato, potato chips from two different companies, pastry (meshaltet), jam, grilled fish, canned fish, full cream and skimmed cheese (kareesh), boiled egg, omlette (egga), cooked liver, sausage(mombar), cooked meat, canned meat, sausage hot dog (sogok), cooked okra, two types of mixtures from vegetables, cooked egg plant (mesakaa), green salad and two type of (mahshi), beingpepper and egg plant filled with rice and some green leafy vegetables (Mahshi pepper and egg plant).

The collected samples were extracted as soon as they arrived. Many precautions were taken to avoid any contamination. The samples were subjected to the different methods of analysis.

The samples were kept at –20 ^{0}C to avoid any degradation due to the complexity of matrices. The estimated dietary Intakes were calculated based on the national food consumption data from the Institute of Nutrition. In some samples without exact food consumption data, the mean of their constituents food consumption values was taken.

Chemicals and reagents:

- Acetone, dichloromethane, n-hexane, petroleum ether, acetonitrile, (Pestiscan chromatography grade or similar quality) ethanol 95-96%.
- Anhydrous sodium sulphate (Riedel-de haen) sodium chloride, sodium hydroxide.
- Florisil 60-100 mesh (Merck)
- De-ionized water
- Nitric acid (HNO_3) (supra pure - Merck-reagent grade)
- 2 Mol/L HNO_3 (130 ml of HNO_3 is diluted to 1L with distilled water) used for cleaning the digestion flasks.
- 0.3% HNO_3 (5 ml conc. acid is diluted to 1L with distilled water).

- Reagents used as matrix modifier: A mixture of 10 gm of ammonium-di-hydrogen phosphate ($NH_4H_2PO_4$) and 0.87 gm of magnesium nitrate ($Mg(NO_3)_2$. 6 H_2O).
- Pb, Cd, Cu stock standards, 1000 mg/L (Merck's ambulles).
- Intermediate and working solutions of Pb, Cd, and Cu prepared from stock solution with different concentrations in 0.3 N HNO_3.
- Potassium nitrate for nitrate analysis, more than 99%.
- Mobile phase: methanol/water/n-octyl ammonium phosphate which was prepared by mixing 800 ml water, 200 ml methanol and 1.63 ml n-octyl amine, the pH of the solution was adjusted at pH=4-6 using 10% phosphoric acid solution (mobile phase should be freshly prepared every 3 days).

Reference standard:

All pesticide reference materials were certified standard and were provided by Dr. Ehrenstorfer Gmbl, Gogginer Str.78, D-8900 Augoburg, Germany, and by the FAO (Food Agriculture Organization of the United Nations, Rome, Italy) and were prepared in n-hexane/acetone mixture.
The investigated pesticides and their limits of determination (LOD) in mg/kg were as follows:

Table (1) The names of pesticides analyzed and their limits of determinations in mg/kg

Pesticide	LOD	Pesticide	LOD	Pesticide	LOD
Acephate	0.01	Alachlor	0.02	Atrazine	0.10
Bendiocarb	0.10	Bromopropylate	0.05	Carbaryl	0.50
Carbosulfan	0.10	Captan	0.10	Chlorothalonil	0.02
Chlorpyrifos	0.02	Chorpyrifos-methyl	0.05	Chlordane-transe	0.02
Chlordane-cis	0.02	Cyanophos	0.05	Cyfluthrin	0.10
Cypermethrin	0.10	Lambadacyhalothrin	0.10	Chlorpropham	0.50
DDD-p,p	0.02	DDE-p,p	0.02	DDT-o,p	0.02
DDT-p,p	0.02	Deltamethrin	0.20	Diazinon	0.05
Dichlofluanid	0.05	Dicofol	0.02	Dieldrin	0.01
Dimethoate	0.05	Diniconazole	0.02	Edifenfos	0.10
Endosulfan-alpha	0.02	Endosulfan-beta	0.02	Endosulfan sulphate	0.02
Endrin	0.10	Ethion	0.10	Fenamiphos	0.10
Fenitrothion	0.02	Fenpropathrin	0.05	Fenthion	0.05
Fenvalerate	0.01	HCH-alpha	0.01	HCH-beta	0.02
HCH-delta	0.01	HCH-gamma(lindane)	0.02	Heptachlor	0.01
Heptachlor epoxide.	0.01	Hexachlorobenzene	0.01	Imazalil	0.01
Iprodion	0.50	Malathion	0.02	Metalaxyl	0.20
Metamidiphos	0.05	Metrtibuzin	0.10	Monocrotophos	0.05
Omethoate	0.05	Oxidiazone	0.10	Parathion	0.05
Parathion-methyl	0.05	Pendimethalin	0.10	Permethrin	0.10
Phenthoate	0.10	Phosalone	0.05	Phosphamidone	0.10
Pirimicarb	0.05	Pirimiphos-ethyl	0.02	Pirimiphos-me	0.05
Procymidone	0.05	Profenophos	0.02	Promcarb	0.10
Propiconazole	0.10	Prothiofos	0.02	Pyrazophos	0.02
Terbuconazole	0.10	Tetradifon	0.03	Tolcophos-me	0.02
Triadmefon	0.05	Triadimenol	0.10	Triazophos	0.02
Trifluraline	0.01	Vinclozolin	0.01		

The standard solution which was used in nitrate analysis was potassium nitrate ACROS 2591-1000= 99% and its LOD=5 mg/kg. While Cu, Pb and Cd were from Merck and their limits of quantification were 0.1, 0.04 and 0.002 mg/kg, respectively.

Extraction and cleanup:

Multiresidue method for pesticides: According to the method described by **Luck *et al.* (1981)** residues were extracted from a representative homogenized portion of each food by blending with acetone. The pesticides were transferred from the aqueous filtrate into an organic phase by shaking with petroleum ether and dichloromethane after drying. The cleanup was carried out as described by **Suzuki *et. al.* (1979)** using a florisil column. The organic phase was concentrated just to dryness and dissolved in hexane/acetone (9:1) for GC detection. This method allows the determination of 80 pesticide residues.

Heavy metals method: An analytical method described in the thesis of **Thabit (2001)** and suitable for all kinds of food was selected for determination of lead, cadmium and copper. Three-six grams of homogenized fresh samples were transferred to glass digestion flasks with 10 ml of conc. HNO3. The solutions were boiled for 72 hours, depending on the sample matrix. The nitric acid solution was evaporated, and the residue was transferred with 0.3 N HNO3 into 25-ml volumetric flasks.

Nitrates method: The method described by **Cheng and Sang (1998)** was followed. Ten g of the homogenized samples were extracted by 100 ml of water and heated on a water bath at 70°C for half an hour and shacked every five minuets, cooled at room temperature and filtered using Whatman filter paper no. 1. An aliquot from the clear solution was taken for further purification by a syringe filter (0.45μm). The filtered solution was directly injected into the LC system using HP 1100 series

Determinations:

Mutiresidue of pesticides: Qualitative and quantitative determination of pesticide residue in food samples depends on the use of two different polarities of chromatography columns. Each GC instrument (NPD, ECD) has its capillary columns with different polarities and consequently two detectors. The internal standard technique was followed for the quantitative determination. Aldrin was used for organochlorine and pyrethroid compounds and ditalimphos for organophosphorous and organonitrogen compounds. The internal standard was added before injection to GC.

Heavy metals: Lead and cadmium were determined by an electrothermal atomic absorption spectrometer (AAS), using a deuterium lamp for background correction, cuvette atomization and argon gas. A mixture of $NH_4H_2PO_4$ and $Mg(NO_3)_2$ were used as a matrix modifier. Cu was determined by flame atomic absorption using a deuterium lamp for background correction and airacetylene gas.

Nitrates: HPLC determination:

- Mobile phase: methanol/water/n-octyl ammonium phosphate
- HPLC column: MOS hypersil 5X200X4.6 mm.

- Injection volume10µ l
- UV wave length 220 nm
- External standard method was used for calculations

Quality assurance procedures: All analytical methods and instructions were carefully validated as a part of the laboratory quality assurance system and were audited and accredited by the Center of Metrology and Accreditation Finnish Accreditation Service (FINAS) ISO/IEC Guide 25. The criteria of quality assurance were described in Dogheim *et al. (2002)*. The recoveries were between 70-120% and CV less than 20%. Low level fortification of all samples with the contaminants of interest was carried out to ensure that the method performed satisfactorily for the particular food examined. Analysis of duplicate of samples represents precision analysis.

Apparatus and equipment:

A) Multiresidue analysis of pesticides

- Gas chromatograph HP 5890 equipped with double electron capture detector (ECD) and two capillary columns, injector 225^{0}C, detector 280^{0}C, operating conditions: nitrogen carrier gas 2.5 ml /min; 65 ml/ min (carrier + make up) , column head pressure 82 K pa.
- Gas Chromatograph, HP 6890 equipped with double nitrogen phosphorous detector (NPD) and two capillary columns; injector 225 ^{0}C detector 280 ^{0}C. Operating conditions hydrogen 3.5 ± 0.1 ml/min. air 100-110 ml/min, and nitrogen carriers gas 2.5 ml/min for both GC's. The specification of chromatography columns are as follows:

1. PAS-5 ECD tested ultra 2 silicon, 25m X 0.32 mm. Film thickness 0.52 µm.
2. PAS –1701 ECD tested 1701 silicon, 25 m X 0.32mm film thickness 0.25µm. Temperature programs of both GC instruments were as follows: Initial temp 90^{0}C for 2 min; ramp (1) 20 ^{0}C /min to 150 ^{0}C, ramp (2) 6 ^{0}C /min to 270 ^{0}C hold for 15 min.

B) Heavy metals analysis:

- Atomic absorption spectrometer (AAS) (Analytical technology, INC. Unicam 929) equipped with graphite furnace with auto sampler and flame atomic absorption.

Typical furnace parameters for lead and cadmium in AAS are given in the following Table:

Step	Temp. (°C)	Time (sec.)	Ramp (°C/sec)	Gas flow (ml/min)
Drying	120	40	30 (Cd), 10 (Pb)	2
Ashing	800	20	50	2
Atomization	1800	3	0	0
Cleaning	2500	3	0	2
Cooling	20	5	0	2

- Wet digestion system (Digester tecator 2020)
- Digestion flasks equipped with holes
- Volumetric flasks (25 ml)

C) Nitrate analysis:

HPLC -equipped with,

- Detector: HP 1100 A programmable fluorescence detector
- Mobile phase: Methanol/water /n-octyl ammonium phosphate.
- HPLC column: MOS hypersil 5X200X4.6 mm.
- Injection volume : 10 ul.
- UV wavelength: 220 nm.
- External standard method was used for calculations.

RESULTS AND DISCUSSION

Individual diets study:

The results of pesticides multiresidue analysis for the analyzed diets showed that there is no contamination found with organochlorine pesticides, and this may be because of the complete ban on such compounds in more than 20 years. This result is in consistent with our national monitoring programs (Dogheim *et. al.* 1999, 2001 and 2002). The Results also showed that, only the hot dog (sogok) sample was contaminated with a small amounts of chlorpyrifos-me, chlorpyrifos and profenofos with a mean concentration of <LOD, 0.04 and 0.06 mg/kg, respectively, most probably due to adding of spices which contain high amounts of organophosphorous compounds this result agrees with that of (Salama 2003). The dietary intake from pesticide residues is a very small and negligible amount.

The monitoring data in Table 2 show that all analyzed diets were contaminated with copper. This is the most abundant contaminant found followed by cadmium and lead, which is in accordance with Khorshid *et al* (2003). Liver showed a very high level of 43.3mg/kg copper, which may be attributed to the retaining function of the liver. While lentils showed the lowest level of 0.25 mg/kg.

Analyzed food diets showed less contamination with cadmium, where thirteen samples were free from Cd and 5 samples have less than the limit of detection. The highest contamination was in potato chips. Many reasons may affect such increasing, among which tubers and roots have relatively high concentrations of cadmium due to soil or water contamination. These results agree with those of Feng *et al.* (1993) and Khorshed *et al.* (2003). More recently, further cadmium has been added to agricultural soils through the use of phosphate fertilizers and certain organic fertilizers based on manure. Also, the decreasing water content of potatoes during the frying process leads to an increase of cadmium concentration in potato chips. In addition the frying oil may also have contaminated with cadmium.

Twenty samples were found free from Pb, 10 have below the limit of detection, and only 3 samples were contaminated with lead. The highest concentration was in falafel with a mean concentration of 0.2 mg/kg. Falafel is made of many fresh green leafy vegetables, which may planted at the borders of the field near roads which have high concentrations of Pb from the fuels used in vehicles. The obtained results are in agreement with those of Feng *et al.* (1993), and Khorshed (2003).

The data in Table 2 reveal that 23 diet samples were contaminated with nitrates. Most of the free samples are from animal origin, all samples from plant origin were contaminated with nitrates. This may be attributed to the use of nitrogen fertilizers in agriculture (Bulgarkra *et al.* 1996 and El-Agrodi *et al.* 2001).

Table (2) Mean concentrations of copper, cadmium, lead and nitrates found in analyzed diets expressed in mg/kg.

	Copper	Cadmium	Lead	Nitrates
Cooked bean (medames)	4.83	0.003	0.05	49
(Falafel)	4.71	0.003	0.26	129
(Bosara)	2.90	ND*	ND	89
Cooked potatoes	1.72	0.005	<LOD	48
Boiled potatoes	0.94	<LOD**	ND	18
Potatoes (chips)	3.28	0.011	ND	801
Potatoes (chips)	3.86	0.015	ND	834
Cooked rice	0.84	0.002	<LOD	83
(Mahshi)g. pepper	1.20	ND	ND	164
(Mahshi) egg plant	1.50	ND	ND	27
(Mombar)	1.61	ND	ND	ND
Macaroni(béchamel)	0.54	ND	ND	ND
Macaroni with sause	0.54	0.009	<LOD	37
Lentils	0.25	0.003	<LOD	26
(Koshari)	0.77	0.005	<LOD	30
Cooked dry beans	1.57	0.003	<LOD	48
Cooked vegetable mix.	1.14	0.003	<LOD	28
Cooked vegetable mix.	2.98	0.002	<LOD	52
Cooked okra	1.21	<LOD	ND	33
C. eggplant(mesakaa)	0.84	<LOD	<LOD	221
Salad	0.40	0.011	0.044	116
Double cream cheese	0.96	ND	ND	ND
Skimmed cheese	0.03	<LOD	ND	ND
Boiled egg	1.03	ND	ND	ND
(Egga) omlet	0.71	ND	ND	ND
Boiled Meat	0.86	<LOD	ND	28
Canned beef	1.12	ND	ND	ND
Liver	43.3	ND	ND	87
Fig jam	0.29	0.004	<LOD	18
(Meshaltet) pastry	0.90	ND	ND	ND
Hot dog (Sogok)	0.70	ND	ND	75
Fish	0.30	ND	ND	ND
Canned fish	0.30	0.013	ND	ND

* ND is not detected ** <LOD is less than limit of determination

Potato chips have a high concentration of nitrates 801 and 834 mg/kg. This probably because of the use of nitrogen fertilizers in the soil, the reduction of the water contents by the frying process. Moreover, during the manufacture nitrates are added as preservative materials. This concentration is considered high especially for infants and children because of their possible increased susceptibility to adverse effects (Larsen and Pascal

1998). Mesakaa and salad concentrations have 221 and 116 mg/kg nitrates. This high concentration may be attributed to the extensive use of nitrogen fertilizers in greenhouse agriculture to get high production, especially of green pepper and cucumber. Also the results in table 2 indicate that the nitrate concentration in the item (mahshi) green pepper (164 mg/kg) is higher than (mahshi) of egg plant (27 mg/kg), which has almost the same constituents. The following item was falafel, which has 129 mg/kg because falafel contains many leafy vegetables such as dill, green coriander, leek and parsley all of which have a high concentration of nitrates.

Total Diet Study:

The dietary intake study shows that all the estimated dietary intakes (EDIs) are below the corresponding acceptable daily intakes (ADI's) established by WHO (1987and 1995). Organochlorine pesticide residues show no dietary intakes while organophosphorous pesticides contaminate the diet with a very low and negligible amount from chlorpyrifos, chlorpyriphos-me and profenophos. Concerning the contamination of the total diet by heavy metals in this study, there is no sample exceeded for the corresponding established PMADI or PTWI. The data of dietary intakes reveals that Cu contaminated all the analyzed diet and its EDI was 3.7% from the estimated provisional maximum acceptable daily Intakes (PMADI) which is 0.5 mg/kg bw/day. Cooked potatoes contributed about 17.4% from the total contamination with Copper.

A total diet study is very important because it takes in many factors, which affect the amount of the intakes, among which the food balance sheet and the weight of the person. Our data show that, in spite of liver being the most contaminated sample with Cu, it is changed from 43.3mg/kg to 129.9mg/kg, while (medames) becomes 236.67 mg/kg instead of 43.83 mg/kg. So, medames comes to the top of the list of Cu contaminating samples because the food consumption of medames is higher than liver. Also, in the case of potato chips the weight of the person and the consumption are very important. In the case of children we do the calculation with about 10 kg instead of 60 kg for a normal person. So, the intakes of those contaminants are increased and consequently more adverse to the children. Moreover, the food consumption of children more or less differs from mature persons. With that evidence we need more details about the food balance sheet and food consumption data to get a better evaluation for these subgroups and consequently more accurate intakes for each group.

Cadmium contaminates the diet by 3.5% when comparing it with its established provisional tolerable weekly Intakes (PTWI) which is 7 μg/kg. bw./week. About 39% of its contamination come from cooked potato. Only lead had the lowest concentration in the analyzed diets that contaminate 3.2% from the PTWI, which is 25μg/kg bw /week. The most contaminated item was falafel, which contaminates the diet with 34.38% of the studied total diet. The study shows that nitrate contaminates the studied diets by 25.7% of its ADI (3.65 mg/kg b.wt/day). Potato chips have the highest concentration, which contaminates the diet by 47.6% which is considered high especially for children.

Table (3) Estimated Dietary Intake for heavy metals and nitrates found.

	Food	Copper		Cadmium		Lead		Nitrates	
	cons.	Mean	MxFc	Mean	MxFc	Mean	MxFc	Mean	MxFc
Cooked bean (medames)	49	4.83	236.67	0.003	0.147	0.05	2.45	49	2401
(Falafel)	9	4.71	42.39	0.003	0.027	0.26	2.34	129	1161
(Bosara)	3.3	2.90	9.57	ND	-	ND	--	89	293.7
Cooked potatoes	91	1.72	194.5	0.005	0.819	<LOD	--	48	26799.5
Boiled potatoes		0.94		<LOD		ND		18	
Potatoes (chips)		3.65		0.011		ND		801	
Potatoes (chips)		3.86		0.015		ND		834	
Cooked rice	110	0.84	141.63	0.002	0.055	<LOD	--	83	7535.0
(Mahshi)g. pepper		1.20		ND		ND		164	
(Mahshi) egg plant		1.50		ND		ND		27	
(Mombar)		1.61		ND		ND		ND	
Macaroni(béchamel)	15	0.54	7.8	ND	0.068	ND	--	ND	277.5
Macaroni with souse		0.54		0.009		<LOD		37	
Lentils	13	0.25	3.25	0.003	0.039	<LOD	--	26	338
(Koshari)	46	0.77	35.42	0.005	0.23	<LOD	--	30	1380
Cooked dry beans	3	1.57	4.71	0.003	0.009	<LOD	--	48	144
Cooked vegetable mix.	113	1.14	202.6	0.003	0.141	<LOD	--	28	9435.5
Cooked vegetable mix.		2.98		0.002		<LOD		52	
Cooked okra		1.21		<LOD		ND		33	
C. eggplant(mesakaa)		0.84		<LOD		<LOD		221	
Salad	45	0.40	18	0.011	0.495	0.044	1.98	116	--
Double cream cheese	4	0.96	1.98	ND	--	ND	--	ND	5220
Skimmed cheese		0.03		<LOD		ND		ND	
Boiled egg	3	1.03	2.61	ND	--	ND	--	ND	--
(Egga)		0.71		ND		ND		ND	--
Boiled Meat	29.5	0.86	25.37	<LOD	--	ND	--	28	826
Canned beefy meat	4	1.12	4.48	ND	--	ND	--	ND	--
Liver	4	43.3	173.2	ND	--	ND	--	87	234
Fig jam	4	0.29	1.16	0.004	0.016	<LOD	--	18	72
(Meshaltet)	6.4	0.90	5.76	ND	--	ND	--	ND	--
(Sogok)	3	0.70	2.1	ND	--	ND	--	75	225
Fish	25.1	0.30	7.53	ND	--	ND	--	ND	--
Canned fish	3	0.30	.9	0.013	0.039	ND	--	ND	--
Total Consum.xMean		1116.03		14.595		47.39		56442.2	
EDI/person/day		0.0186.94 mg/kgb.wt		0.24325 ug/kg b.wt		0.7898 ug/kg b.wt		.9407033 mg/kg.b.wt	
% of EDI/Accep. intake		3.7%		3.5%		3.2%		25.7%	
Acceptable intakes established by WHO		PMADI =0.5 mg/kg.b.wt/day		PTWI=7µg/kg b.wt/week		PTWI=25µg/kg. b.wt/week		ADI=3.65 mg/kg. b.wt/day	

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الدراسة الكلية للمتناول اليومى لبعض الوجبات الغذائية الجاهزة فى القاهرة الكبري لعام ٢٠٠٢

اميل يوسف سلامه ، محسن محمد ايوب ، مني عبد العزيز خورشيد
المعمل المركزى لتحليل متبقيات المبيدات والعناصر الثقيله فى الأغذيه
مركز البحوث الزراعيه- ٧ شارع نادى الصيد الدقى – الجيزه .

أتاحت الدراسة الكلية للوجبات التعرف على مستوي المتناول اليومي لعدد (٨٠) مبيد كلوريني و نيتروجيني و فوسفورى وبعض البيرثرويدات.

كما تناولت الدراسة أيضا ثلاث معادن ثقيلة وهى النحاس والكادميوم و الرصاص بالأضافه إلى النيترات. تم تجميع عدد (٣٣) عينه من الوجبات الجاهزة للآكل من القاهرة الكبرى خلال عام ٢٠٠٢.

اعتمدت الدر اسه على الاستهلاك اليومى للإنسان المصرى من هذه الوجبات الصادرة من معهد التغذية بوزارة الصحة .

أظهرت الدراسه على وجه العموم أنه لايوجد متناول يومى من المركبات الكلورينية الخاضعة للدراسه بينما يوجد بعض المتناول الضعيف من بعض المركبات الفوسفوريه مثل الكلوربيريفوس والكلوربيريفوس ميثيل والبروفينوفوس.

تبين الدراسه أن عناصر النحاس والكادميوم والرصاص تشارك فى تلوث الوجبات التى تم تحليلها بالمعمل بنسب ٣,٧% و٣,٥% و ٣,٢% على التوالى من النسب المسموح بها الموضوعه من قبل منظمة الصحه العالميه كما كان تلوث الوجبات بنسبة ٢٥,٧% من المسموح به من التناول اليومى من النيترات.

ومن ثم فأنه بتحليل هذه الوجبات تبين أنها نظيفة وأمنه . كما يجب توخى الحذر لتقليل نسب المتناول اليومى من هذه الملوثات فى بعض الوجبات مثل الفول المد مس والفلافل ورقائق البطاطس المقليه والكبده .